

September, 1990  
Supersedes Descriptive Bulletin 41-240,  
pages 1-2, dated October, 1989  
Mailed to: E, D, C/41-200A

For Detection of Ground Faults on Lines,  
Transformers, and Multi-Winding Machines  
Device Number: 32N

## Types CWC, CWP, and CWP-1 Directional Ground Relays

### Application

The CWC, CWP, and CWP-1 relays are applied for directional ground fault protection on grounded neutral power systems.

### Type CWC

The CWC relay is current polarized. The relay develops torque proportional to the product of the polarizing and residual currents and the cosine of the phase angle between them.

The CWC relay is recommended at stations where the power transformer bank neutral is grounded. In such cases the residual voltage will generally be small.

### Type CWP

The CWP relay is voltage-polarized by residual voltage obtained across the open corner of the delta winding of a grounded wye-delta voltage transformer. The relay develops a torque proportional to the product of the polarizing voltage and the residual current and the cosine ( $\theta - 60$ ) where the  $\theta$  is the angle by which the relay current lags the relay voltage.

The CWP relay is recommended for use where the power transformer bank neutral is not available.

### Type CWP-1

The CWP-1 relay is similar to the type CWP relay except it has a higher sensitivity.

The relay is applicable for selective alarm or tripping for systems where the ground fault current is limited to a range of about 0.2% to 8% of rated full load current. The system must be high-resistance grounded because of the maximum torque angle characteristic of the CWP-1 (maximum torque when current leads voltage by  $45^\circ$ ).

### Construction

#### ① Tap Block

Volt-amperes indicated on tap plate represent the minimum pickup product of residual current and polarizing voltage at maximum torque angle. Tap changing is accomplished by a tap screw. When tap position is changed, the spare tap screw is inserted into the desired new position prior to removal of the original, to avoid open-circuiting of the current transformer.

#### ② Time Dial

Indexed setting from  $\frac{1}{2}$  to 11 are clearly visible. With a fixed multiple of tap value, setting #11 gives the maximum operating time in seconds.

#### ③ Stationary Contact

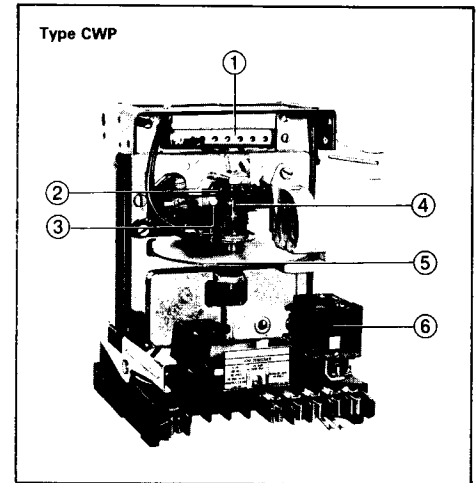
Made of pure silver. Will close 30 amperes at 250 volts dc. Has sufficient wipe to assure positive contact. In fast breaker reclosing schemes which require quick-opening relay contacts, the metal plate is reversed, holding the stationary contact fixed against the back-stop. On double-trip relays, adjustment of  $\frac{3}{8}$ " contact follow (or wipe) is obtained by use of a vernier adjusting screw on the stationary contact plate.

#### ④ Moving Contact

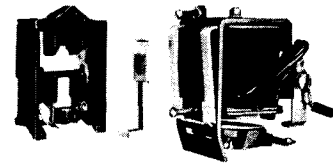
Also made of pure silver. Electrical connection is through a spiral spring from the contact to the spring adjuster frame, and then to the relay terminals.

#### ⑤ Induction Disc Unit

The moving disc assembly which carries the moving contact is rotated by an electro-magnet located at the rear of the relay and, to obtain the desired time-product operating curve, is damped by a permanent magnet. The disc shaft is supported at the lower end by a steel ball bearing which rides between concave sapphire jewel surfaces, and at the upper end by a stainless steel pin.



#### ⑥ Indicating Contactor Switch (ICS)



Indicates relay operation by means of a target which drops into visual position upon completion of a trip circuit.

When energized at or above pickup value, moving contacts bridge two stationary contacts and complete the trip circuit. The ICS contacts are connected in parallel with the main relay contacts and relieve them of carrying heavy circuits.

The main relay contacts will close 30 amperes at 250 volts dc, and the ICS contacts will safely carry this current long enough to trip a circuit breaker. Front-located taps provide connection for 0.2 or 2.0 ampere dc minimum pickup setting.

The operation indicator target is reset external to the relay case by means of a push rod located in the bottom of the relay cover.

**Construction**

**① Tap Block**

Volt-amperes indicated on tap plate represent the minimum pickup product of residual current and polarizing voltage at maximum torque angle. Tap changing is accomplished by a tap screw. When tap position is changed, the spare tap screw is inserted into the desired new position prior to removal of the original, to avoid open-circuiting of the current transformer.

**② Time Dial**

Indexed setting from 1/2 to 11 are clearly visible. With a fixed multiple of tap value, setting #11 gives the maximum operating time in seconds.

**③ Stationary Contact**

Made of pure silver. Will close 30 amperes at 250 volts dc. Has sufficient wipe to assure positive contact. In fast breaker reclosing schemes which require quick-opening relay contacts, the metal plate is reversed, holding the stationary contact fixed against the back-stop. On double-trip relays, adjustment of 1/8" contact follow (or wipe) is obtained by use of a vernier adjusting screw on the stationary contact plate.

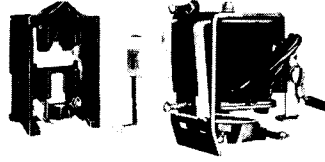
**④ Moving Contact**

Also made of pure silver. Electrical connection is through a spiral spring from the contact to the spring adjuster frame, and then to the relay terminals.

**⑤ Induction Disc Unit**

The moving disc assembly which carries the moving contact is rotated by an electromagnet located at the rear of the relay and, to obtain the desired time-product operating curve, is damped by a permanent magnet. The disc shaft is supported at the lower end by a steel ball bearing which rides between concave sapphire jewel surfaces, and at the upper end by a stainless steel pin.

**⑥ Indicating Contactor Switch (ICS)**



Indicates relay operation by means of a target which drops into visual position upon completion of a trip circuit.

When energized at or above pickup value, moving contacts bridge two stationary contacts and complete the trip circuit. The ICS contacts are connected in parallel with the main relay contacts and relieve them of carrying heavy circuits.

The main relay contacts will close 30 amperes at 250 volts dc, and the ICS contacts will safely carry this current long enough to trip a circuit breaker. Front-located taps provide connection for 0.2 or 2.0 ampere dc minimum pickup setting.

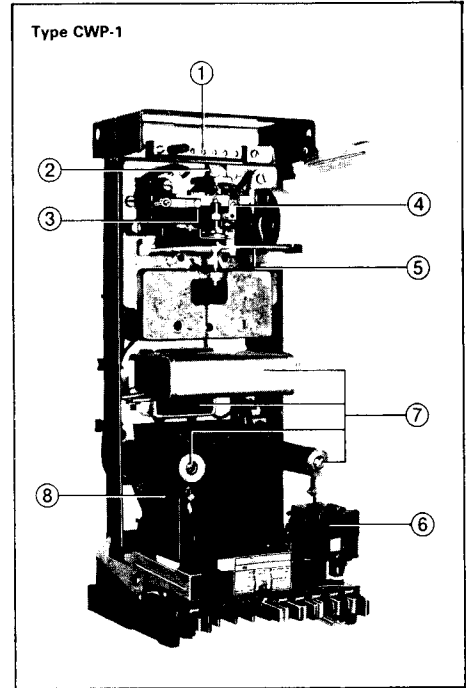
The operation indicator target is reset external to the relay case by means of a push rod located in the bottom of the relay cover.

**⑦ Phase Shifting Transformer**

Consists of a capacitor and resistor connected in series with the lower pole circuit.

**⑧ Current Transformer**

Relay settings are provided by a tapped auxiliary step up transformer which supplies current to the upper poles of the relay electromagnet. Transformer has a maximum ratio of 20/1.



**Shipping Weights and Carton Dimensions**

Relay Type	Flexitest Case Type	Weight, Lbs., Approx. (KG)		Domestic Shipping Carton Dimensions: Inches (Cm)
		Net	Shipping	
CWC	FT-21	12 (5.5)	16 (7.3)	9 x 12 x 13 (23 x 30 x 33)
CWP	FT-21	12 (5.5)	16 (7.3)	9 x 12 x 13 (23 x 30 x 33)
CWP-1	FT-31	16 (7.3)	20 (9.1)	13 x 13 x 21 (33 x 33 x 53)

**Further Information**

- List Prices: PL 41-020
- Technical Data: TD 41-025
- Instructions:
  - CWC and CWP Relays, IL 41-242.4
  - CWP-1 Relay, IL 41-242.5
- Renewal Parts: RPD 41-927
- Flexitest Case Dimensions: 41-076
- Contactors Switches: DB 41-081
- Other Protective Relays:
  - Application Selector Guide, TD 41-016



December, 1990  
Supersedes TD 41-020, Types CWC, CWP  
and CWP-1 on pages 59 and 60, dated  
November, 1987  
Mailed to: E, D, C/41-200A

For Detection of Ground Faults on Lines,  
Transformers, and Multi-Winding Machines

# Types CWC, CWP, and CWP-1 Directional Ground Relays

## Product, Single Phase, Ground Protection (Device Number: 32N)

Type	Polarization	Contacts	I <sup>2</sup> Product Range	Indicating Contactor Switch <sup>③</sup>	Instantaneous Trip: IIT <sup>⑤</sup>	Relay Data		
						Internal Schematic	Style Number	Case Size
CWC <sup>①</sup>	Current	Spst-cc	.25-4.0	0.2/2.0 amps dc	None	57D7919	291B935A09	FT-21
						57D7920	670B989A09	
		Dpst-cc	2.25-36	4-16	57D7921	291B935A21		
				10-40		291B935A22		
		Spst-cc		None	57D7919	291B935A10		
				10-40	57D7921	291B935A23		
		20-80		291B935A24				

## Product Single Phase, Ground Protection Continued (Device Number: 32N)

Type	Polarization	Contacts	V <sub>1</sub> Product Range	Indicating Contactor Switch <sup>③</sup>	Instantaneous Trip: IIT <sup>⑤</sup>	Relay Data				
						Internal Schematic	Style Number	Case Size		
CWP <sup>①</sup> <sup>②</sup>	Voltage	Spst-cc	20-150	0.2/2.0 amps dc	None	183A711	291B928A09	FT-21		
						2-8	183A713		291B928A11	
						4-16			291B928A12	
			10-40			291B928A13				
			75-600		None	183A711	291B928A10			
					2-8	183A113	291B928A14			
		4-16			291B928A15					
		Dpst-cc	20-150	None	183A712	291B928A23	FT-21			
								2-8	183A714	291B928A17
								4-16		291B928A18
			75-600	None	183A712	291B928A24				
								2-8	183A714	291B928A20
4-16								291B928A21		
10-40		291B928A22								

CWP-1 <sup>②</sup>	Voltage	Spst-cc	Sensitivity 0.3 amp at 250V	0.2/2.0 amps dc	None	188A417	292B865A09	FT-31
		Dpst-cc			None	188A425	292B865A10	

## Potential Polarizing Transformers, Single Phase (Product Bulletin 42-871 for dimensions)<sup>④</sup>

Volt-amps	Frequency, Hertz	Primary Volts		Secondary Volts	Compensated at:		Connections Primary/Secondary	Style Number	
		Line to Line	Line to Neutral		Volt- amps	Power Factor			
50	50/60	115	66.5	115	25	100%	Connect wye/broken delta	9626A06G01	
		200	115					66.5	9626A06G02
		200	115					115	9626A06G03

① 50-Hertz relays and auxiliaries can be supplied at same price. Order "Similar to Style Number . . . . ., except 50 Hertz".

② See potential polarizing transformers, this page.

③ ICS: Indicating Contactor Switch (dc current operated) having seal-in contacts and indicating target which are actuated when the ICS coil is energized at or above pickup current setting. Suitable for dc control voltages up to and including 250 volts dc. Two current ranges are available:  
(1) 0.2/2.0 amps dc, with tapped coil.  
(2) 1.0 amp dc, without taps.

Rating of ICS unit used in specific types of relays is shown in price tables. All other ratings must be negotiated.

When ac current is necessary in a control trip circuit, the ICS unit can be replaced by an ACS unit.

The ACS unit may be supplied in place of an ICS unit at no additional cost. Specify system voltage rating on order.

④ Refer to LVIT Sales, Low Voltage Instrument Transformer Division, Pinetops, NC, for price and shipment.

⑤ IIT: Indicating Instantaneous Trip rated per ranges shown in price tables. Unit is nondirectional, adjustable, and has target actuated when coil is energized at or above pickup setting. Unit has a dropout ratio of 65% at minimum setting and 90% at maximum setting.